IN THE SPECIFICATION:

Please replace paragraph number **[0020]** with the following rewritten paragraph:

[0020] The silica matrix may be formed *in vitro* under mild reaction conditions. Since the silica matrix is formed by a biomimetic process, it is also referred to herein as biosilica. The silica matrix may ~~includes~~ include particles or nanospheres of biosilica that have a diameter ranging from approximately 400 nm to approximately 600 nm. For instance, the biosilica may have an average diameter of 500 nm. The silica matrix may include pores having a pore size of less than approximately 100 nm. For instance, the silica matrix may have ~~pores~~ pore sizes ranging from approximately 10 nm to approximately 100 nm, such as from approximately 10 nm to approximately 15 nm. The silica matrix may be a network of fused silica particles. The matrix in which the molecule is immobilized may also be a titanium-containing material, such as titanium dioxide.

Please replace paragraph number **[0028]** with the following rewritten paragraph:

[0028] Since the silaffin polypeptide precipitates the hydroxylated water-soluble derivative quickly, the silica matrix may be formed and the molecule may be immobilized within the silica matrix substantially simultaneously. Furthermore, since the immobilization reaction is performed under mild reaction conditions, the silica matrix may be synthesized in the presence of the molecule to be immobilized without affecting the activity of the molecule. The precipitated biosilica may then be separated from solution, producing the biosilicification product having the molecule immobilized in the silica matrix. The immobilized molecule may be entrapped in the pores of the silica matrix, which provides a stable environment for the immobilized molecule. As such, the activity of the immobilized molecule may be preserved even when the biosilicification product is exposed to room temperature for extended time periods or elevated temperatures for shorter time periods.

Please replace paragraph number **[0037]** with the following rewritten paragraph:

Example 2

Preparation of Biosilicification Products

[0037] Biosilicification products were synthesized using the R5 peptide stock and silicic acid in the presence of the enzyme (butyrylcholinesterase, HRP, or catalase) to be immobilized. The silica matrix was prepared and the ~~enzyme~~ enzyme was immobilized in a one-pot procedure.

Please replace paragraph number **[0043]** with the following rewritten paragraph:

Example 3

Activity of the Immobilized Butyrylcholinesterase Product

[0043] The suitability of the silica matrix as an immobilization matrix for butyrylcholinesterase was determined with the immobilized butyrylcholinesterase product described in Example 2. To determine whether the butyrylcholinesterase retained its activity after the immobilization reaction, the activity of the butyrylcholinesterase entrapped in the silica matrix was compared with the activity of the free enzyme. Butyrylcholinesterase activity was measured spectrophotometrically at 630 nm using indophenyl acetate (2×10^{-4} M) as the substrate and a cholinesterase specific buffer (0.1 N NaOH, 0.1 M KH_2PO_4, pH 8). At pH 8.0, cholinesterases hydrolyze the yellow indophenyl acetate to a blue reaction product (4-(4-hydroxy-phenylimino)-cyclohexa-2,5-dienone). The absorptivity of the product was determined to be $8.1 \times 10^{-3}\ M^{-1}\ cm^{-1}$ based ~~on~~ on an assumption of complete conversion by butyrylcholinesterase. Silica particles were removed by centrifugation (10 seconds at 14,000 x g) before determination of absorbance. All assays were performed at room temperature unless otherwise stated. Protein concentration was determined by using a bicinchonic acid ("BCA") protein assay kit (available from Pierce Biotechnology Inc.).

Please replace paragraph number **[0048]** with the following rewritten paragraph:

[0048] These results indicated that HRP and catalase retained their activity during the biosilicification reaction. It was estimated that from approximately 15% to approximately 40% of the ~~HRP~~ HRP, or ~~catalase~~ catalase, added to the biosilicification reaction was immobilized within the silica matrix, while the remainder was recovered in the supernatant or from the buffer washes.

Please replace paragraph number **[0053]** with the following rewritten paragraph:

Example 5

Stability of the Butyrylcholinesterase Immobilized Product

[0053] The stability of the butyrylcholinesterase during storage at 25°C was evaluated over a 30-day period to determine whether the butyrylcholinesterase immobilized product is suitable for a wide range of applications. The stability during storage at 25°C of the free enzyme in a buffer solution, of the free enzyme in the buffer solution including an antibiotic/antimycotic, and of the butyrylcholinesterase immobilized product in the buffer solution was determined. The antibiotic/antimycotic was purchased from Sigma-Aldrich Co. and included 10,000 units/ml penicillin G, 10 mg/ml streptomycin sulfate, and 25 μg/ml amphotericin B in 0.9% sodium chloride. For these long-term stability experiments, duplicates of free enzyme and the butyrylcholinesterase immobilized product were prepared with and without the addition of an antibiotic/antimycotic solution (Sigma) at a final concentration of 10 ml/L. As shown in FIG. 6, the immobilized enzyme retained 100% of the initial activity when stored ~~in~~ in an aqueous buffer for 30 days. In contrast, the free enzyme lost activity rapidly. The stability of the free enzyme was prolonged by the addition of the antibiotic/antimycotic solution, indicating that the loss of the enzyme activity was due to microbial degradation. The addition of the same antibiotic/antimycotic solution to the silica matrix did not change the stability. When the butyrylcholinesterase immobilized product was dried under vacuum before storage at 25°C, the activity was again retained for 30 days. The results indicate that immobilization of the butyrylcholinesterase in the silica matrix provided a stable environment for the enzyme and

prevented the loss of activity that occurs when the enzyme is stored in solution at room temperature.

Please replace paragraph number **[0056]** with the following rewritten paragraph:

Example 7

Flow-through System Utilizing the Butyrylcholinesterase Immobilized Product

[0056] A stable immobilized enzyme system provides an opportunity to exploit a number of applications that would not be feasible with a soluble enzyme system. The stability of the immobilized butyrylcholinesterase product was demonstrated in a flow-through mini-reactor system in which the butyrylcholinesterase was continually reused over an extended period of time. The immobilized butyrylcholinesterase product was prepared in two alternative systems: a ~~fluidized~~ fluidized-bed system and a packed-bed system. A flow rate of 1 $ml \cdot min^{-1}$ was used in both the fluidized-bed and packed-bed systems. In both of these systems, complete conversion of the indophenyl acetate solution continued for over 1000 column volumes (500 ml) of the indophenyl acetate solution with no significant loss in enzyme activity or conversion efficiency, as shown in FIG. 7.